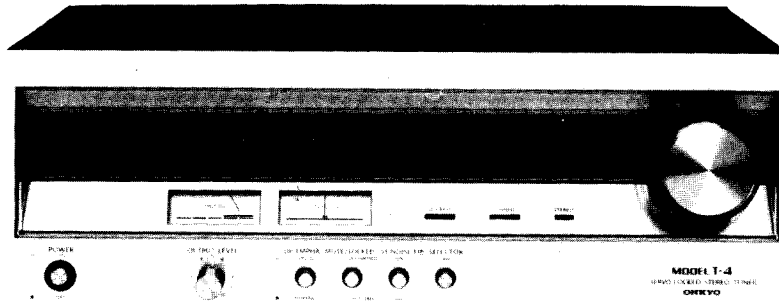


# ONKYO SERVICE MANUAL

## SERVO LOCKED AM/FM STEREO TUNER

### Model T-4



#### SPECIFICATIONS

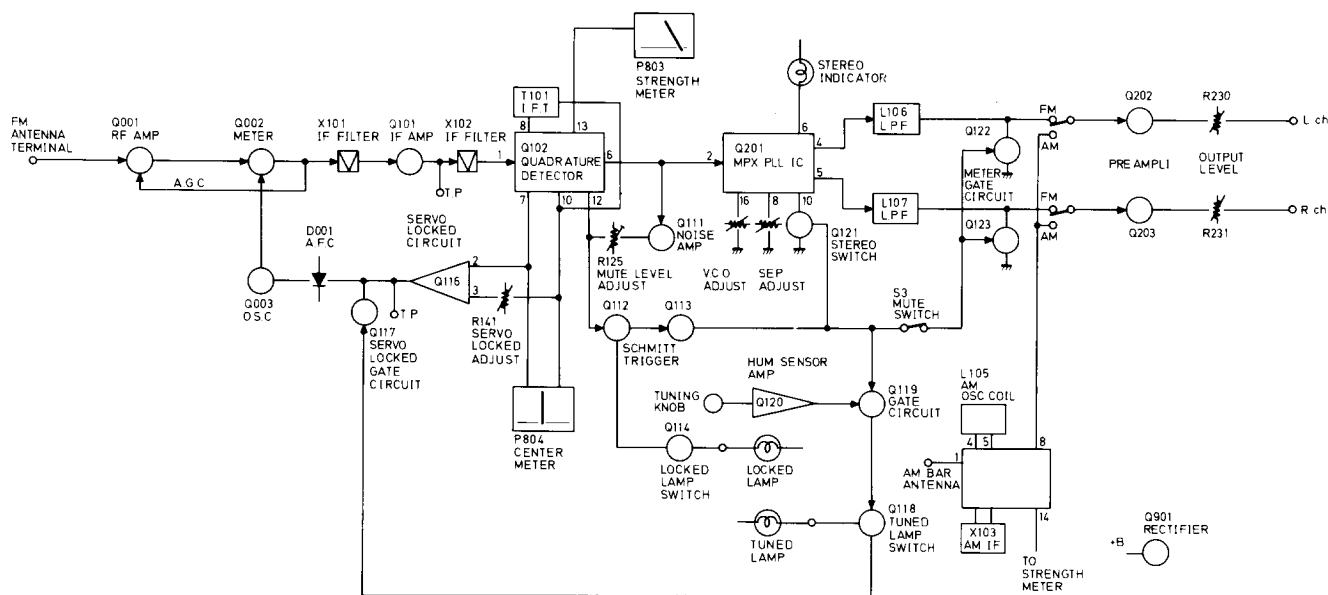
Tuning Range	FM: 88 ~ 108MHz AM: 530 ~ 1605kHz	Harmonic Distortion	FM Stereo: 0.4% AM: 0.8%
Usable Sensitivity	FM Mono: 10.8dBf (1.9μV) FM Stereo: 18.3dBf (4.5μV) AM: 25μV	Stereo Separation	FM: 40 dB at 1kHz 30 dB from 100Hz to 10kHz
50dB Quieting Sensitivity	FM Mono: 16.1dBf (3.5μV) FM Stereo: 37.2dBf (40μV)	Sub Carrier Suppression	FM: 60 dB
Intermediate Frequency	FM: 10.7 MHz AM: 455 kHz	Muting Level	FM: 17.2dBf (4μV)
Capture Ratio	FM: 1.5 dB	Stereo Threshold	FM: 17.2dBf (4μV)
Image Rejection Ratio	FM: 60 dB AM: 40 dB	Servo Locked Level	FM: 17.2dBf (4μV)
IF Rejection Ratio	FM: 90 dB AM: 30 dB	Frequency Response	FM: 30Hz~15kHz (+0.5, -2 dB)
Spurious Rejection	FM: 85 dB	Output Voltage	FM: 0 ~ 1V AM: 0 ~ 0.3V
S/N Ratio	FM Mono: 70 dB FM Stereo: 60 dB AM: 40 dB	<b>General</b>	
Alternate Channel Attenuation	FM: 60 dB	Power Supply	AC 120V (60Hz)
AM Suppression Ratio	FM: 50 dB	Power Consumption	11W
Harmonic Distortion	FM Mono: 0.2%	Semiconductors	5 ICs, 1 FET, 16 transistors, 24 diodes
		Dimensions	6¼"(H) x 17½"(W) x 15"(D) 159(H)x444(W)x380(D)mm
		Weight	13.4 lbs. (6.1 kg.)

Specifications and features are subject to change without notice.

**ONKYO**  
**AUDIO COMPONENTS**



## BLOCK DIAGRAM



## Automatic Servo Locked Tuning System

The outstanding feature of this high quality stereo tuner is the Servo Locked Tuning System. FM stations are tuned immediately, automatically, and accurately, without the slightest fine tuning adjustment required at all. Simply tune approximately to the desired FM station, and then let go. The automatic servo locked tuning circuit does the rest, fine tuning the station with uncanny electronic precision. The station remains firmly "locked" for as long as you want without the slightest hint of station drift — a great advantage during important recording sessions.

## “Human Touch Sensor” Tuning Knob

An essential part of the Servo Locked Tuning System is the tuning knob itself, connected to a special sensor circuit. When your hand touches the tuning knob to tune to the desired station, the servo locked tuning circuit is temporarily "disconnected". But when you let go of the tuning knob, after tuning approximately to the FM station, the servo locked tuning circuit is reactivated via the special sensor circuit, locking the station to dead center tuning. No fine tuning adjustments are required since the servo lock system automatically compensates for tuning differences.

## FET Front End

High sensitivity matched by minimal intermodulation distortion has been achieved by equipping the front end with a high grade FET (field-effect transistor).

## Phase Locked Loop Stereo Decoder IC

The broadcasting station pilot signal plus a switching signal generated in the MPX (stereo decoder) circuit, are locked in a PLL circuit (enclosed in a specially designed IC) thereby ensuring excellent stereo separation, and a very low distortion level. This IC also features better frequency response and low carrier leak.

## Epoxy PC Board FM Oscillator Circuitry

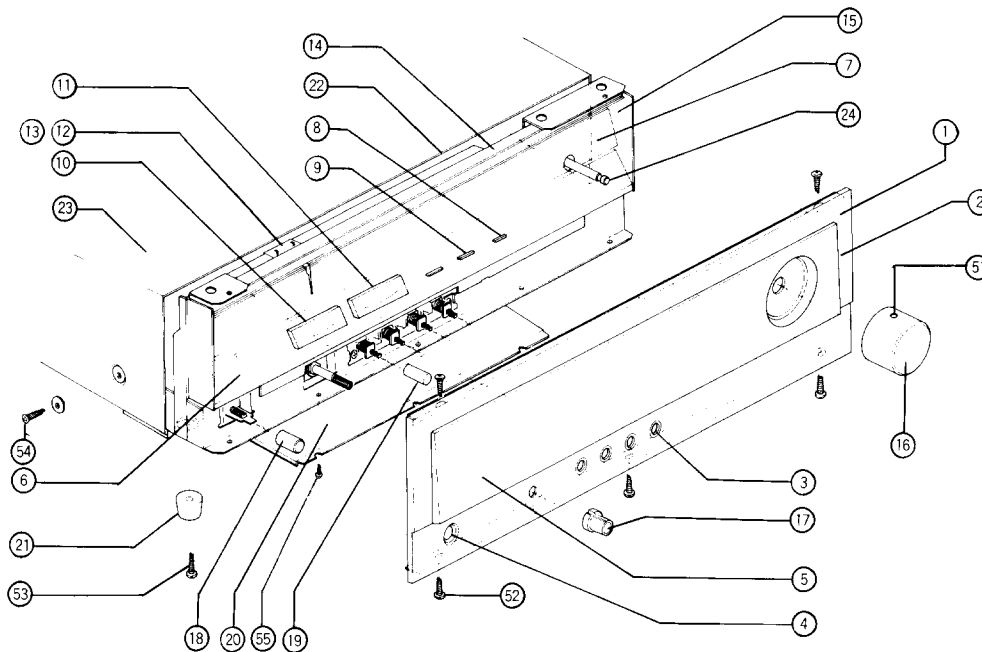
All FM oscillator-elements are on epoxy PC board to ensure drift-free stability in oscillator frequency despite changes in temperature and humidity.

### De-Emphasis Switch

De-emphasis is normally set to NORMAL (75  $\mu$ sec), but for reception of FM Dolby broadcasts switch to the 25  $\mu$ sec position.



## EXPLODED VIEW

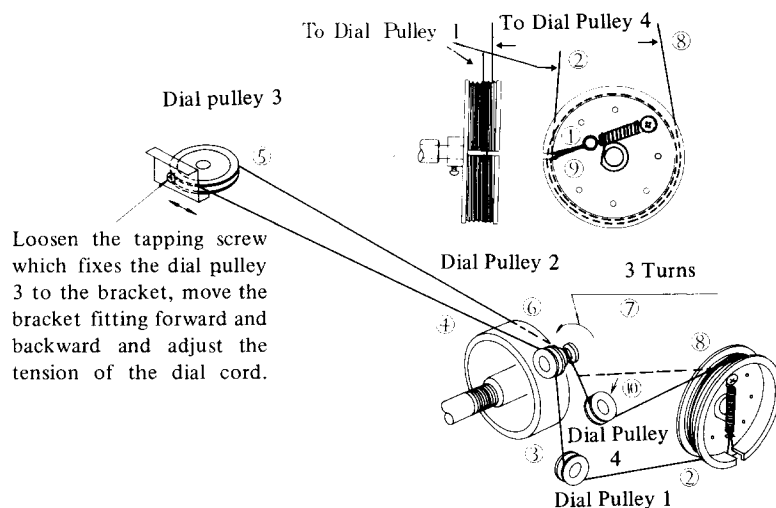


## PARTS LIST

REF. NO.	PARTS NO.	DESCRIPTION
1	13729121	Front Panel Ass'y
2	27210089	Front Panel
3	27267014	Push Knob Guide
4	27267015	Power Knob Guide
5	28191015	Dial Glass
6	27210068	Decorative Plate M
7	28130081A	Dial Plate
8	28198503	Facet
9	28198504	Facet
10	243066A	NIND-0500S66, Strength Meter
11	243067A	NIND-0250S67, Tuning Meter
12	210015A	PL6.3V 50mA W3UL Red, Pointer Lamp
13	28165039	Pointer
14	28194025	Decorative Bar
15	27215017-1	End Cap
16	28320156	TUNING Knob

REF. NO.	PARTS NO.	DESCRIPTION
17	28320157	LEVEL Knob
18	28320159	POWER Knob
19	28320160	Push Knob
20	27170020	Bottom Board
21	280379	Leg
22	28140024	Cushion
23	28184018A	Top Cover
24	27205007A	Drive Shaft
Screws		
51	801146	Enamel Screw
52	834130062	3STS+6BQ
53	832140122	4STR+12BQ
54	838440109	4TTB+10C(BC)
55	831130082	3STW+8BQ

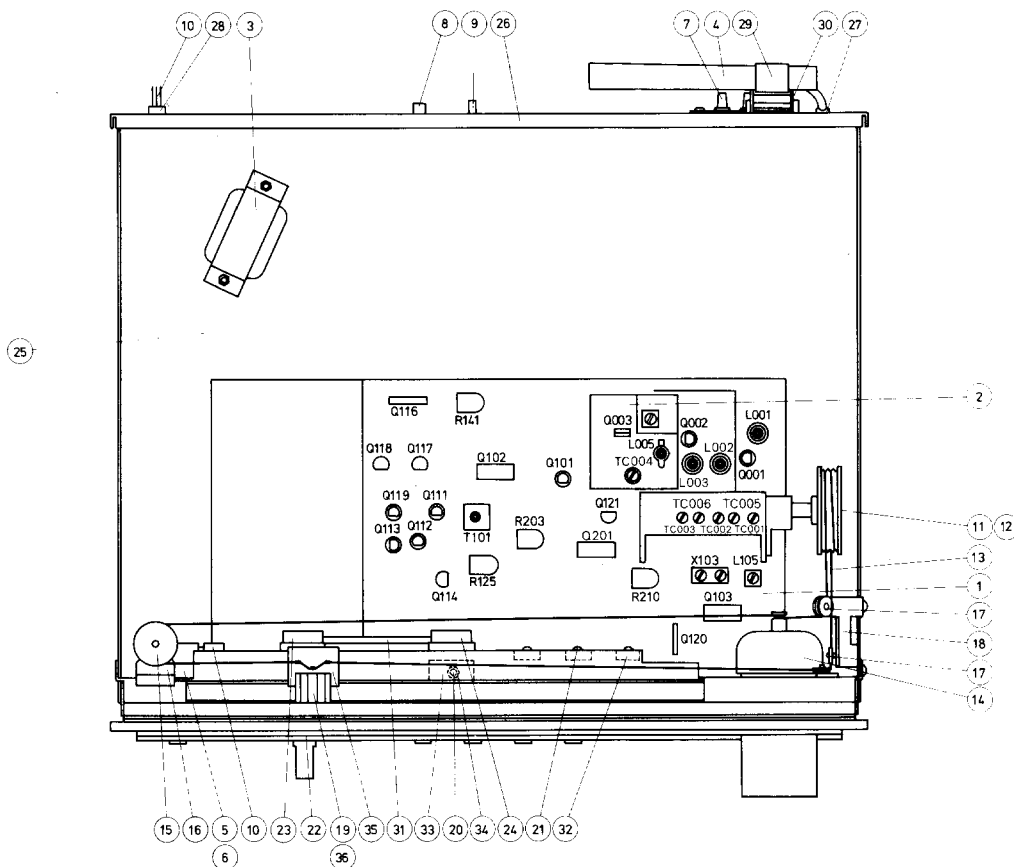
## STRINGING DIAGRAM



1. Close the variable capacitor complete and tie dial cord to the spring of the dial drum.
2. Thread dial cord in the direction of arrow from ① to ⑥ and wind dial cord three turns around the tuning shaft clockwise.
3. Thread dial cord in the direction of arrow from ⑦ to ⑨.
4. Thread dial cord to the dial pulley 4.



## COMPONENT LOCATION



## PARTS LIST

REF. NO.	CIRCUIT NO.	PARTS NO.	DESCRIPTION	REF. NO.	CIRCUIT NO.	PARTS NO.	DESCRIPTION
1	U1	13729546	NARF-446, AM/FM tuner p.c.b.	19	PL801	210015A	6.3V 50mA, Pointer light
2		13729547	NAOSC-447, Oscillator p.c.b.	20	PL802, PL803	210015A	6.3V 50mA, Meter light
3	T901	230196A	NPT-609D, Power transformer	21	PL804~PL806	210030	6V 30mA Locked, Tuned/ Stereo indicator light
4	L801	232061	NMA-1006, AM bar antenna				
5	S901	25035047	NPS-111-L12P, Power switch	22	R230	5147005	N16RG10KB35, Output level volume
6	C901	3504012	0.01 $\mu$ F 125V, UL Capacitor				
7	P801	25060020	NTM-3WPUN1, Antenna terminal	23	P803	243066A	NIND-0500S66, Strength meter
				24	P804	243067A	NIND-0250S67, Center meter
8	P802	25045026	NPJ-2PRBL04, Output terminal	25	A001	27100018C	Chassis
9	S801	25065016	NSS-2327, Hum sensor slide switch	26	A070	27120102	Back panel
				27	A072	270280	SR-4K-4, Strainrelief
10	W901	253072	AS-UC, Power supply cord	28	A071	270025	SR-3P-4, Strainrelief
11	A006	27200020	Dial drum	29	A073	27140091	Antenna bracket
12	A008	273803	SP-14A, Dial drum spring	30	A074	27190021	Antenna holder
13	A009	273903	Dial cord	31	A037	27140126	Bracket
14	A027	27205007	Drive shaft	32	A043	270214-1	Lamp cover
15	A032	27185001	DP-26, Dial pulley	33	A044	27190022-1	Lamp holder
16	A031	27140125A	Bracket	34	A045	28330020	Lam cap
17	A016	27185002	DP-16, Dial pulley	35	A047	28165039	Pointer
18	A015	27140124	Bracket	36	A048	28330020	Lamp cap



# ALIGNMENT PROCEDURES

## INSTRUMENTS REQUIRED

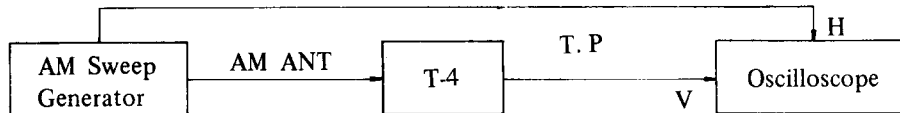
1. AM Sweep Generator
2. AM and FM Signal Generator
3. Vacume Tube Voltage Meter (VTVM) AC, DC
4. Oscilloscope
5. Distortion Analyzer
6. Stereo Modulator
7. Frequency Counter

## GENERAL ALIGNMENT CONDITIONS

1. Signal input should be kept as low as possible.
2. Standard modulation is 400Hz 30 % (AM), 400Hz 100 % (FM MONO) pilot 10 % sub and main 90 % (FM STEREO).

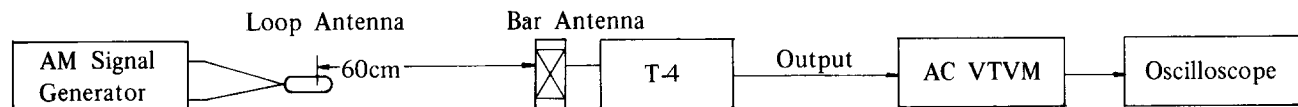
### (1) AM IF ALIGNMENT

1. Set SELECTOR switch to AM.
2. Set radio dial to quiet point.



Set signal	Adjust	Oscilloscope	Remarks
455 KHz	X103 (CFT-455B)	Maximum Symmetrical Response	Usually not necessary to adjust

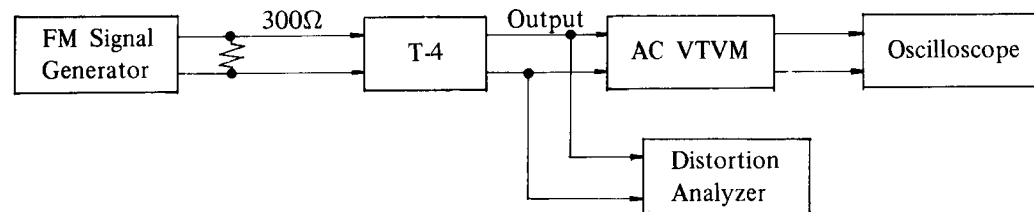
### (2) AM RF ALIGNMENT



Step	Set Signal	Set Radio Dial	Adjust	VTVM reading	Remarks
1	515 KHz 400 Hz 30 %	Lower end (515 KHz)	L105 NMO-2002	Maximum	Repeat step 1 and 2 as necessary
2	1680 KHz 400 Hz 30 %	Upper end (1680 KHz)	TC-006	Maximum	
3	600 KHz 400 Hz 30 %	600 KHz	L801 NMA-1006	Maximum	Repeat step 3 and 4 as necessary
4	1400 KHz 400 Hz 30 %	1400 KHz	TC-005	Maximum	

### (3) FM FRONT END ALIGNMENT

1. Set SELECTOR switch to FM.
2. Push MUTING switch to off.
3. Connect FM Signal Generator to 300-ohm antenna terminals.
4. Connect DC Voltmeter to TP-1 terminals.

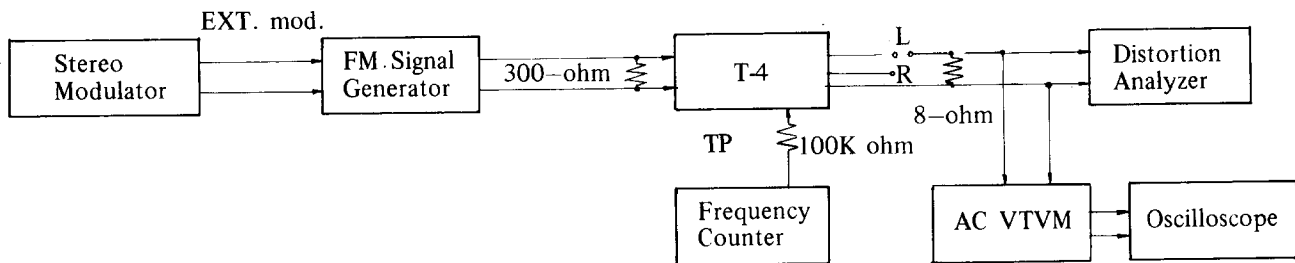




Step	FM Signal Generator	Dial to set	Adjust	Output Indicator	Adjust for	Remarks
1	No signal	Quiet Point	T101 Bottom	DC Voltmeter	OV	Repeat step 1 and 2 as necessary.
2	98 MHz 60 dB 400 Hz 100% mod.	98 MHz	T101 Top	Distortion Analyzer	Minimum	
3	90 MHz 60 dB 400 Hz 100% mod.	90 MHz	L005 OSC Coil NFO-3003	AC VTVM or Oscilloscope	Maximum	Repeat step 5 and 4 as necessary.
4	106 MHz 60 dB 400 Hz 100% mod.	106 MHz	TC004		Maximum	
5	90 MHz 400 Hz 100% mod.	90 MHz	L001, L002, L003		Maximum	Repeat step 5 and 6 as necessary.
6	106 MHz 400 Hz 100% mod.	106 MHz	TC001 TC002, TC003		Maximum	
7	98 MHz 400 Hz 100% mod.	98 MHz	T001 NIT-0518		Maximum	

NOTES: When adjust step 5 and 6, set FM Signal Generator level as low as possible.

#### (4) FM MONO DISTORTION AND MULTIPLEX ALIGNMENT



Alignment	Step	FM Signal Generator	Stereo Modulator	Dial to set	Adjust	Output Indicator	Adjust for	Remarks
Mono Distortion		98 MHz 400 Hz 100% mod. 60 dB	—————	98 MHz	T101 Bottom	Distortion Analyzer	Minimum	
19 KHz	1	98 MHz 400 Hz no mod. 60 dB	—————	98 MHz	R203	Frequency Counter	19000±19 Hz	
	2	STEREO INDICATOR should light up when stereo program is being received.						
Multiplex	1	98 MHz EXT. Mod.	Pilot Sig. 10% Main & Sub Sig. 1 KHz Lch 90%	98 MHz	R210	AC VTVM Right ch.	Minimum	Repeat step 1 & 2 as necessary
	2	Same as above	Pilot Sig. 10% Main & Sub Sig. 1 KHz Rch 90%	98 MHz	R210	AC VTVM Left ch.	Minimum	

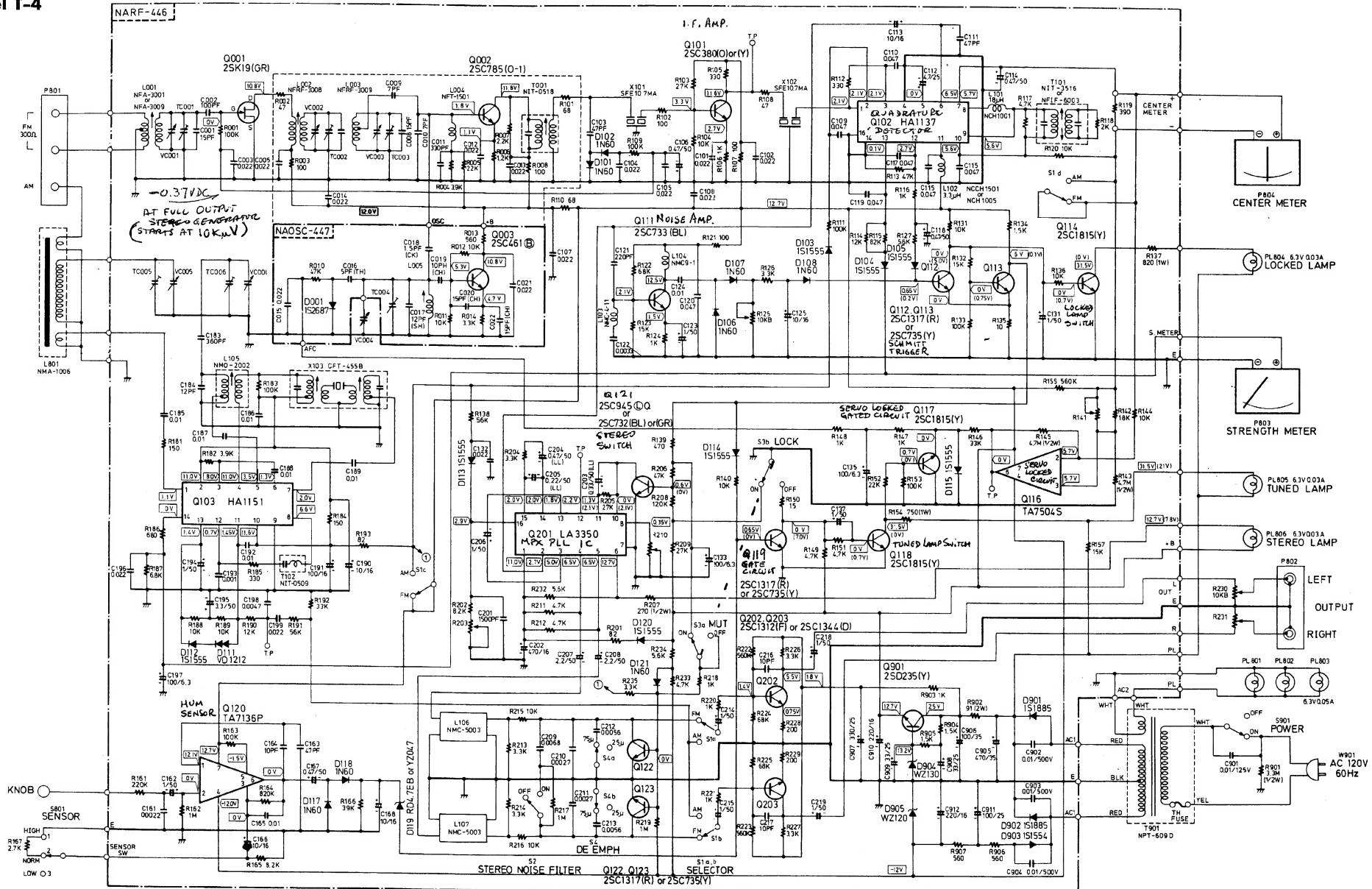
#### (5) SERVO LOCKED ALIGNMENT

Step	FM Signal Generator	Dial to set	Adjust	Muting switch	Indicator	Adjust for
1	98 MHz 400 Hz 100% mod. 60 dB	98 MHz	Dial	OFF	TUNING METER	Center
2	Same as above	98 MHz	R141	ON	TUNING METER	Center



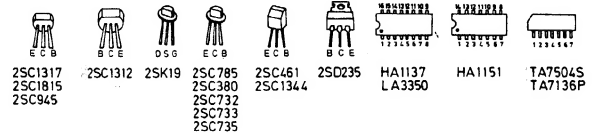
# SCHEMATIC DIAGRAM

Model T-4



SWITCH  
S1 (a,b,c,d) (AM-FM SELECTOR)  
S2 (STEREO NOISE FILTER)  
S3 (a,b) (MUTING, LOCK, MODE)  
S4 (a,b) (DE EMPH)  
S801 (HUM SENSOR)  
S901 (POWER)

NOTES  
• ALL RESISTORS ARE IN OHMS, 1/4 WATT UNLESS OTHERWISE NOTED.  
• ALL CAPACITORS ARE IN  $\mu$ F, 50V UNLESS OTHERWISE NOTED.  
• ELECTROLYTIC CAPACITORS (E) ARE IN  $\mu$ F/VV.  
• VOLTAGE (MEASURED WITH V.T.V.M.) DC VOLTAGE.  
• [ ] (NO INPUT SIGNAL), [ v ] (FM STEREO).



ONKYO CORPORATION



# AM/FM TUNER PC BOARD (NARF-446) – PARTS LIST

CIRCUIT NO. PARTS NO. DESCRIPTION

## TRANSISTORS

Q001	2210374	2SK19GR(O-1), RF amp. F.E.T.
Q002	2210380	2SC785(O-1), Mixer
Q101	2210123 or 2210124	2SC380(O) or FM IF amp.
Q111	2210086	2SC733(BL), Noise amp.
Q112, Q113	2210943 or 2210244	2SC1317(R) or Schmitt trigger
Q114	2211254	2SC1815(Y), Locked lamp switch
Q117	2211254	2SC1815(Y), Servo locked switch
Q118	2211254	2SC1815(Y), Tuned lamp switch
Q119	2210943 or 2210244	2SC1317(R) or Gate circuit
Q121	2210745 or 2210045	2SC945(L)Q or Stereo switch
Q122, Q123	2210943 or 2210244	2SC1317(R) or Muting switch
Q202, Q203	2210943 or 2210244	2SC1317(R) or AF amp.
Q901	2200014	2SD235(Y), Voltage regulator

## ICS

Q102	222421	HA-1137, Quadrature detector
Q103	222418	HA-1151, AM
Q116	222424	TA7504S, Servo locked amp.
Q120	222423	TA7136P, Hum sensor amp.
Q201	222449	LA3350, Multiplex PLL

## DIODES

D101, D102, D106, D107, D108, D117, D118, D121, D103~D105, D120, D112~D115	223103	1N60
D111	4000022	VD1212, Varistor
D119	223943 or 224011	RD4.7EB or Zener
D901, D902	223802	1S1885
D903	223106	1S1554
D904	223924	WZ130, Zener
D905	223910	WZ120, Zener

## COILS

L001	233106 or 233088-1	NFA-3009 or FM RF
L002	233112	NFRF-3008, FM RF
L003	233113	NFRF-3009, FM RF
L004	233037	NFT-1501, Trap
L101	233098	NCH-1001, Choke
L102	233105 or 233024	NCH-1005 or Choke
L103	233018	NMC-4-11
L104	233031	NMC-9-1
L105	232065	NMO-2002, AM OSC
L106, L107	233110	NMC-5003, Low pass filter

## TRANSFORMERS

T001	233085	NIT-0518, FM IF
T101	233083 or 233101	NIT-3516 or NFIF-6003
T102	232041	NIT-0509

## CERAMIC FILTERS

X101, X102	3010003	SFE10.7MA
X103	3010012	CFT455B

CIRCUIT NO. PARTS NO. DESCRIPTION

## CAPACITORS

VC001	3050006	NVC-20FQ327WD02, Variable
C106, C114, C118	352784791	0.47 $\mu$ F 50V, Elect.
C112	352750471	4.7 $\mu$ F 25V, Elect.
C113, C125	352741001	10 $\mu$ F 16V, Elect.
C123, C131, C137	352780101	1 $\mu$ F 50V, Elect.
C133	352741011	100 $\mu$ F 16V, Elect.
C135, C197	352721011	100 $\mu$ F 6.3V, Elect.
C162, C194	352780101	1 $\mu$ F 50V, Elect.
C166, C168	352741001	10 $\mu$ F 16V, Elect.
C167	352784791	0.47 $\mu$ F 50V, Elect.
C183	372323614	360pF $\pm$ 50% 50V, ST
C190	352741001	10 $\mu$ F 16V, Elect.
C191, C202	352741011	100 $\mu$ F 16V, Elect.
C195	352780331	3.3 $\mu$ F 50V, Elect.
C201	372321525	1500pF $\pm$ 10% 50V, ST
C203	392883397	0.33 $\mu$ F 50V, LL
C204	392884797	0.47 $\mu$ F 50V, LL
C205	392882297	0.22 $\mu$ F 50V, LL
C206	352780101	1 $\mu$ F 50V, Elect.
C207, C208	352780221	2.2 $\mu$ F 50V, Elect.
C214, C215, C218, C219	352780101	1 $\mu$ F 50V, Elect.
C905	352764711	470 $\mu$ F 35V, Elect.
C906	352761011	100 $\mu$ F 35V, Elect.
C907	352753311	330 $\mu$ F 25V, Elect.
C908, C909	352753301	33 $\mu$ F 25V, Elect.
C910, C912	352742211	220 $\mu$ F 16V, Elect.
C911	352751011	100 $\mu$ F 25V, Elect.

## VARIABLE RESISTORS

R125	5225017	N10HR10KBC
R141	5225013	N10HR100KBC
R203	5225056	N10HR 5KBC
R210	5225018	N10HR1KBC

## METAL OXIDE FILM RESISTORS

R137	441628214	820 $\Omega$ 1W
R154	441627514	750 $\Omega$ 1W
R902	441729104	91 $\Omega$ 2W

## PUSH SWITCH

S1~S4	25035062	NPS-322-142-L27
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## SHIELDED CASE

27225022	Front end block
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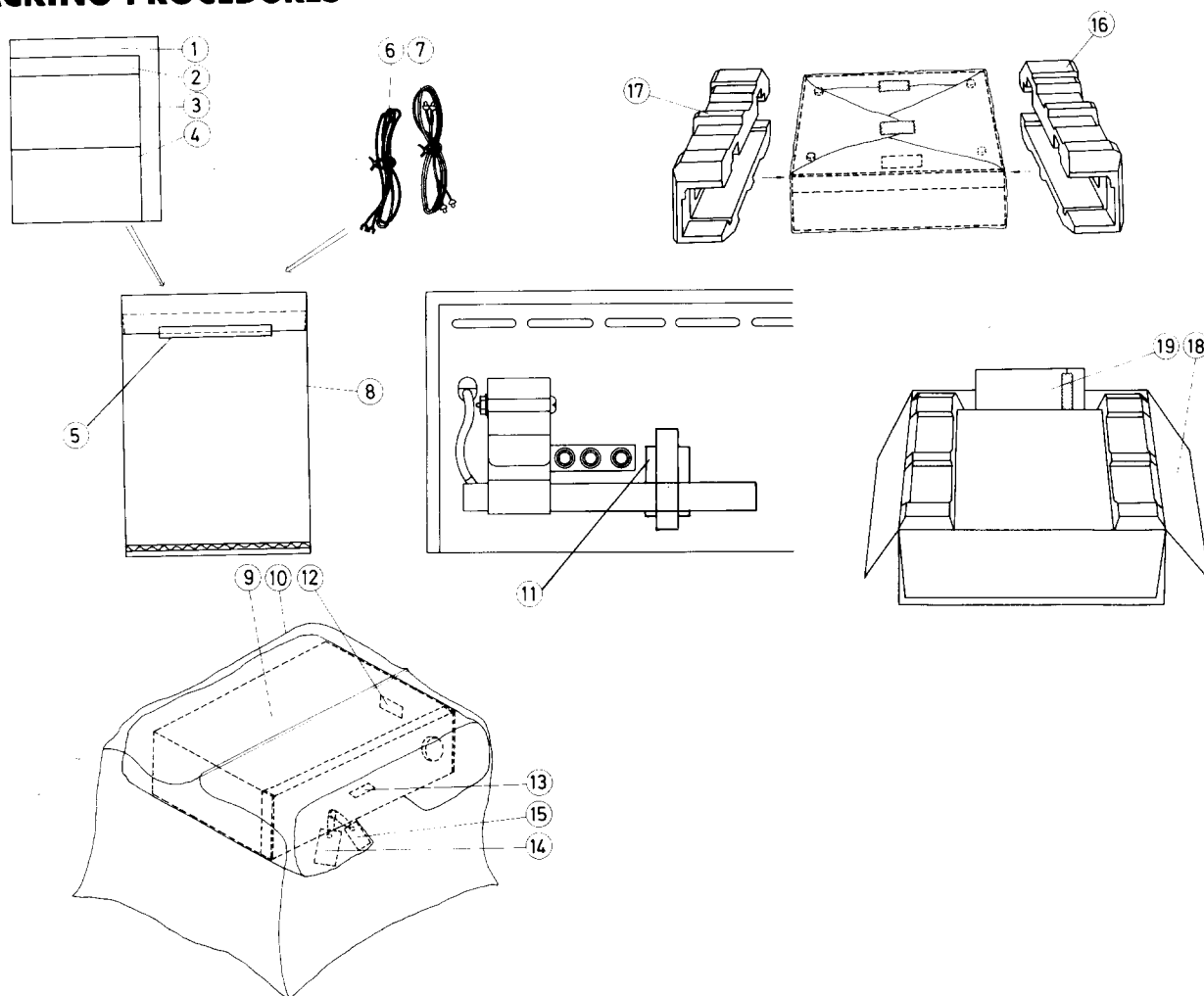
# OSCILLATOR PC BOARD (NAOSC-447) – PARTS LIST

CIRCUIT NO. PARTS NO. DESCRIPTION

Q003	2211342	2SC461B, Oscillator transistor
D001	223110	1S2687, Variable capacitor diode
L005	233090	NFO-3003, Oscillator coil
TC004	3060003	NTC-10P02, Trimmer capacitor
	27150071	Shielded case



## PACKING PROCEDURES



1. All printed material and accessory items are placed in the poly bag.
2. The pad is inserted between the AM bar antenna and the back panel.
3. The sensor switch is set to low position.
4. The cabinet composite tag and sensor tag are attached to the output level control knob.

## PARTS LIST

REF. NO.	PARTS NO.	DESCRIPTION	REF. NO.	PARTS NO.	DESCRIPTION
1	29340244	Instruction Manual	11	29090230	Pad
2	29358001	Service Station List	12	282969	Caution Label A
3	29355046	Caution Card for Warranty Card	13	293041	Caution Label
4	29365003	Warranty Card	14	29380025	Cabinet Composite Tag
5	261504	Adhesive tape	15	29355045	Sensor Tag
6	292064	5059-01, FM Antenna	16	29090178	Pad, Left
7	253074	Connection cord	17	29090179	Pad, Right
8	29100006A	250x350mm, Poly Bag	18	29050158	Carton Box
9	290008	500x1000mm, Sheet	19	13729119	Accessory Bag Complete
10	29100027	850x650mm, Poly Bag			

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